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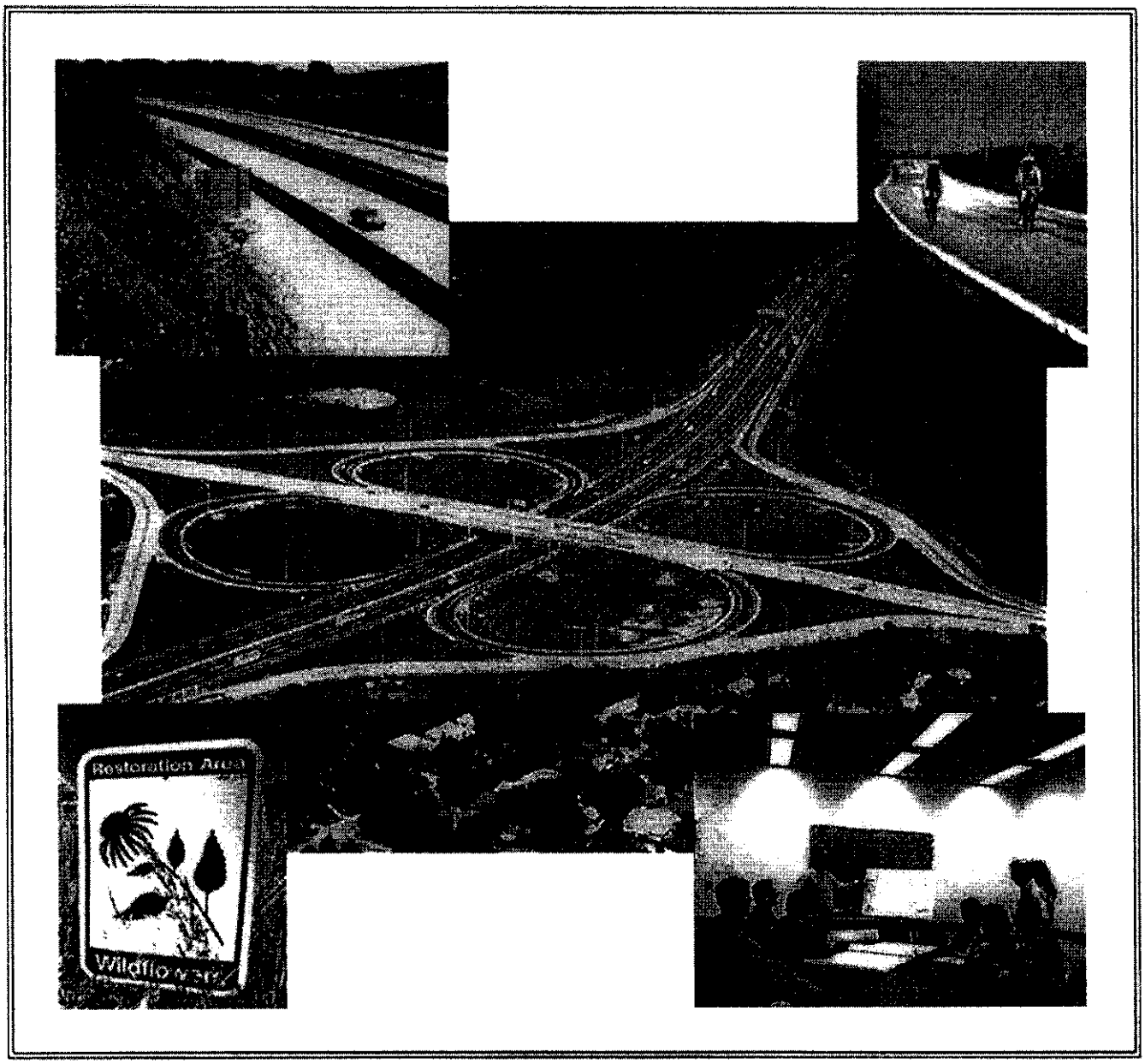


Bureau of Design and Environment Manual

Illinois Department of Transportation
Division of Highways

PREFACE

The *Bureau of Design and Environment Manual* has been prepared to provide uniform practices for the Department and consultant personnel preparing Phase I studies and reports and contract plans for Department projects. The *Manual* presents most of the information normally required in the development of a typical roadway project. The designer should attempt to meet all criteria and practices presented in the *Manual*; however, the *Manual* should not be considered a standard that must be met regardless of impacts. The designer should develop roadway designs that meet the Department's operational and safety requirements while preserving the aesthetic, historic, or cultural resources of an area. Designers must exercise good judgment on individual projects and, frequently, they must be innovative in their approach to roadway design. This may require, for example, additional research into the highway literature.

The *Bureau of Design and Environment Manual* was developed by the Policy and Procedures Section within the Bureau of Design and Environment with assistance from the engineering consulting firm of Roy Jorgensen Associates, Inc.

Chapter Thirty-Six

INTERSECTIONS

BUREAU OF DESIGN AND ENVIRONMENT MANUAL

36-2 TURNING RADII

Turning radii treatments for intersections are important design elements in that they influence the operation, safety, and construction costs of the intersection. The designer must ensure that the proposed design is compatible with the expected intersection operations.

36-2.01 Design for Right-Turning Vehicles

The following sections present several basic parameters the designer needs to consider in determining the proper pavement edge/curb line for right-turning vehicles.

36-2.01(a) Design Vehicle

Section 36-1.08 discusses the selection of the applicable design vehicle for different intersections. These vehicles are used to determine the pavement edge or curb line. Note that the design vehicle will determine the turning width, vehicular path width or swept-path width. The assumed speed of the vehicle is less than 10 mph (15 km/h).

36-2.01(b) Inside Clearance

Desirably, the selected design vehicle will make the right turn while maintaining approximately a 2 ft (600 mm) clearance from the pavement edge or face of curb.

36-2.01(c) Encroachment

To determine the amount of acceptable encroachment, the designer should evaluate several factors. These would include traffic volumes, one-way or two-way operations, urban/rural location, and the type of traffic control. For turns made onto local facilities, desirably the selected design vehicle will not encroach into the opposing travel lanes. However, this is not always practical nor cost effective in urban areas. The designer must evaluate these encroachment conditions against the construction and right-of-way impacts. If these impacts are significant and if through and/or turning volumes are relatively low, the designer may consider accepting some encroachment of the design vehicle into opposing lanes; see Figure 36-2D.

The encroachment allowed into adjacent lanes of the road or street onto which the turn is made will depend on the following:

1. Urban. No encroachment should be allowed into opposing lanes for a right-turning vehicle from a side road or street onto a State route.

2. Rural. For rural intersections, the selected design vehicle should not encroach into the opposing lanes of traffic.

3. Multilane Highways. If there are two or more lanes of traffic in the same direction on the road onto which the turn is made, the selected design vehicle can occupy both travel lanes. Desirably, the right-turning vehicle will be able to make the turn while remaining entirely in the right through lane; see Figure 36-2C.

All intersections of two designated State truck routes should be checked to see if the WB-65 (WB-20) design vehicle can physically make the right turn without backing up and without impacting curbs, parked cars, utility poles, mailboxes, traffic control devices, or any other obstructions, regardless of the selected design vehicle or allowable encroachment.

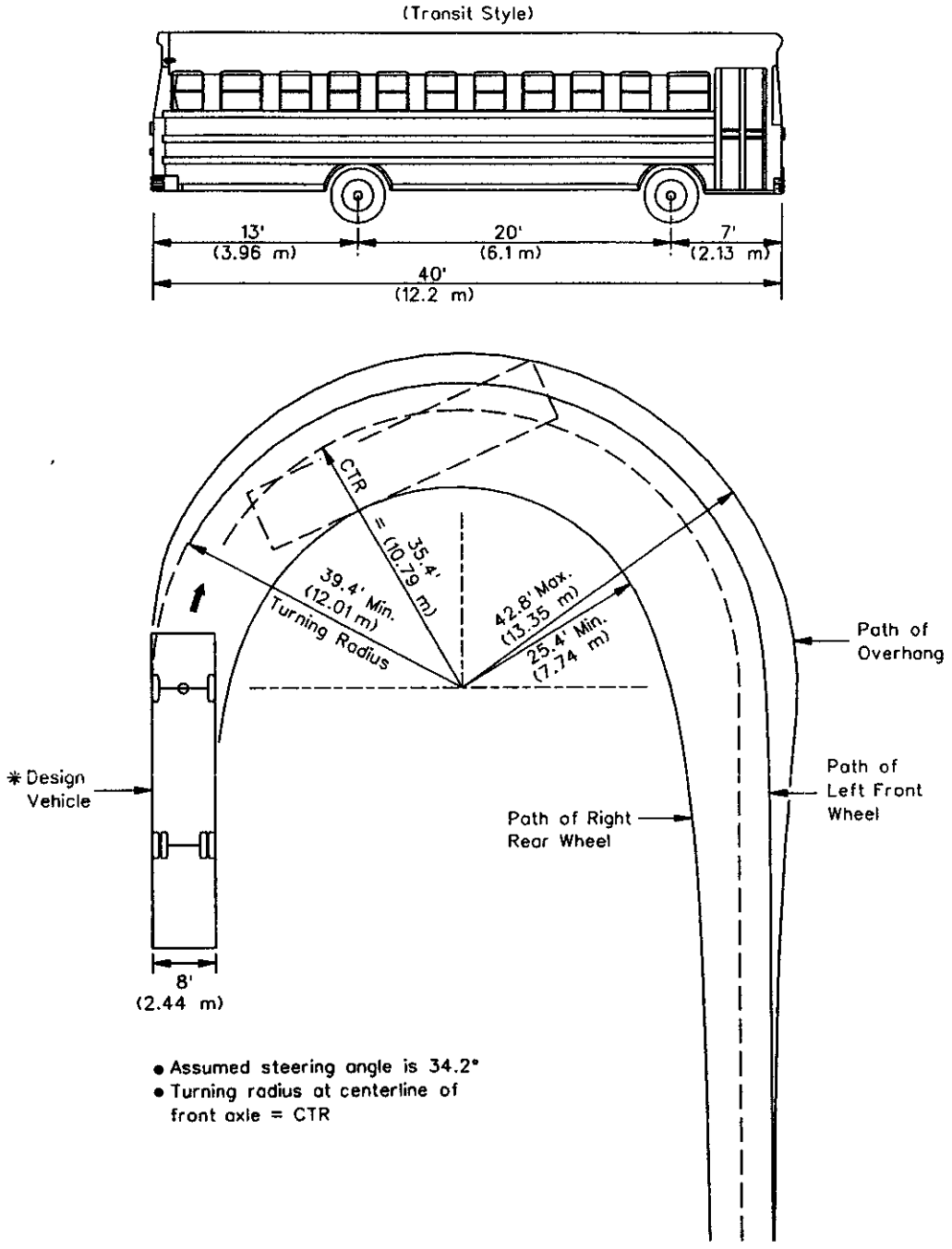
36-2.01(d) Parking Lanes/Shoulders

At many intersections, parking lanes and/or shoulders will be available on one or both approach legs. This additional roadway width may be carried through the intersection. The following will apply:

1. Parking Lanes. Under restricted conditions, the designer may take advantage of shoulder and/or parking lane to ease the problems of large vehicles turning right at intersections with small radius returns. It will be necessary to restrict the parking a significant distance from the intersection. This area should be delineated with striped pavement markings. Parking should be removed from the intersection according to the *ILMUTCD.*

2. Paved Shoulders. At rural intersections, it may be preferable to continue a paved shoulder throughout the radius return. If a shoulder width transition is required, design it according to Figure 36-2A.

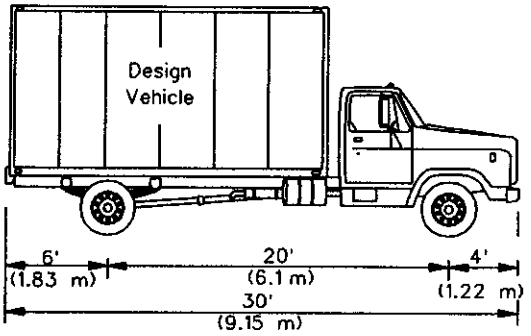
3. Curbing. If certain conditions such as drainage requirements, restricted right-of-way, greater delineation, or the desire to minimize off-tracking warrant the use of curbing along the radius return at rural intersections, terminate the curbing at the shoulder edge and transition the curb height as indicated in Figure 36-2A. Where posted speeds are 50 mph or greater, use a mountable type curb.

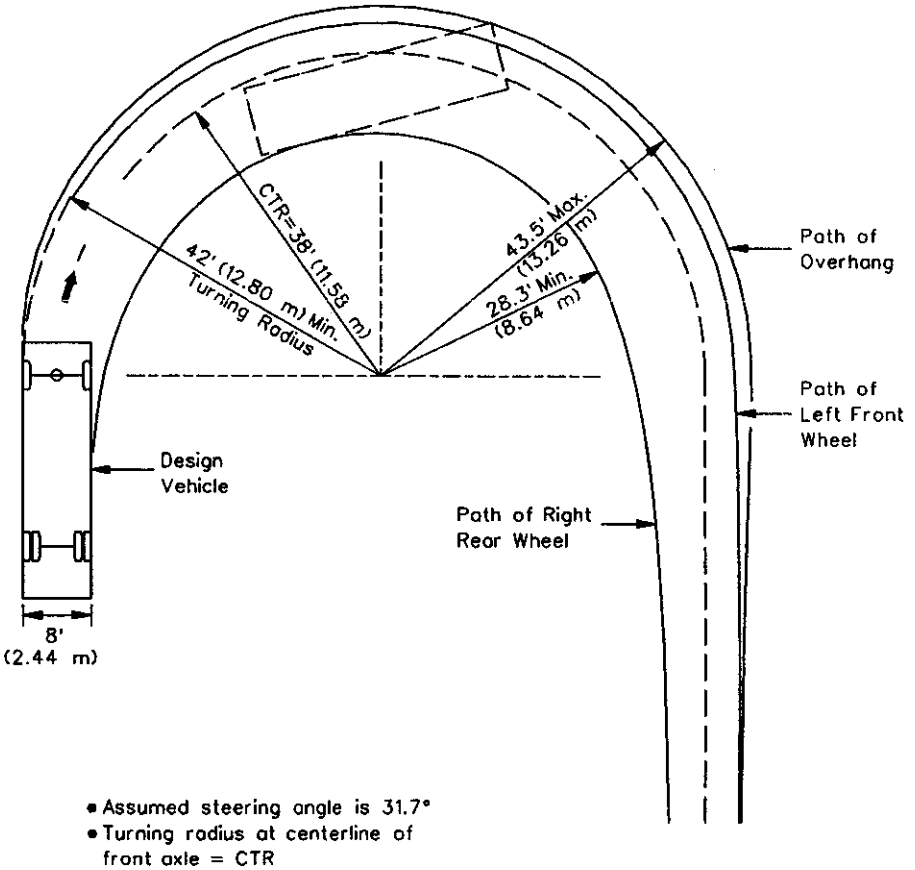


**Note: The 84-passenger school bus is the largest school bus presently manufactured.*

MINIMUM TURNING PATH OF 84-PASSENGER SCHOOL BUS (S-BUS) DESIGN VEHICLE

Figure 36-1L

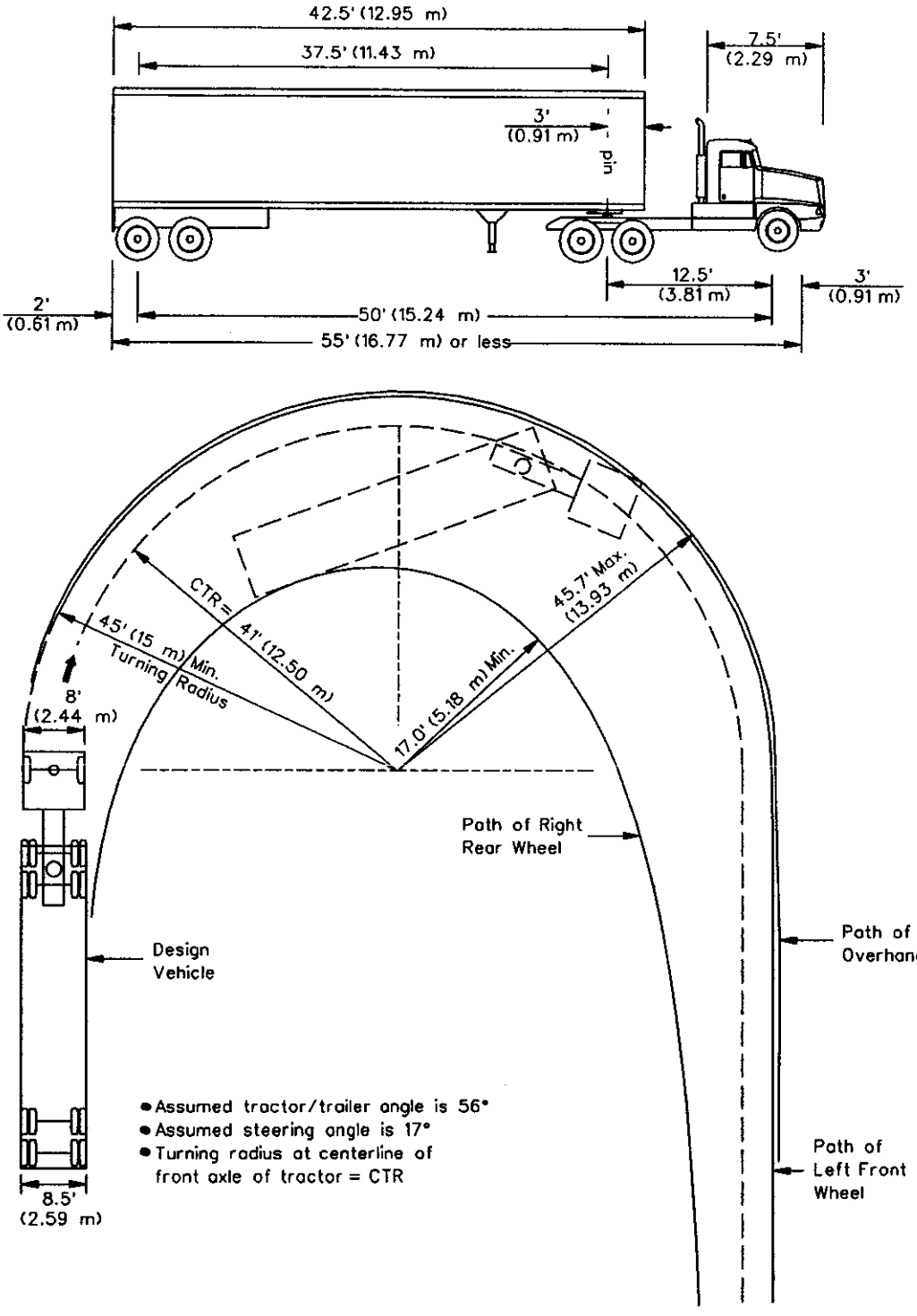




- Assumed steering angle is 31.7°
- Turning radius at centerline of front axle = CTR

MINIMUM TURNING PATH OF SINGLE UNIT (SU) DESIGN VEHICLE

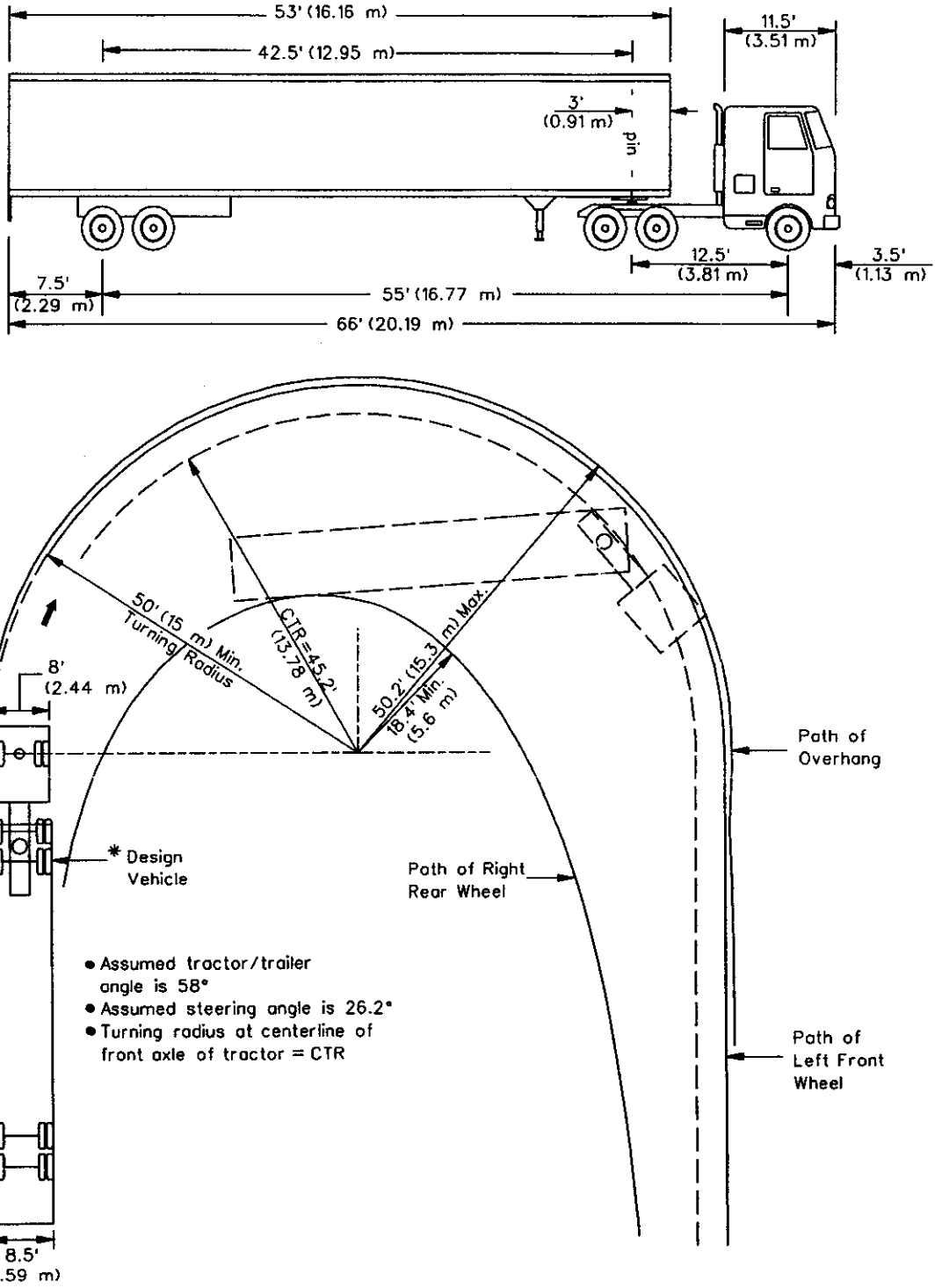
Figure 36-1M



TURNING PATH OF TRACTOR/SEMITRAILER (WB-50 (WB-15)) DESIGN VEHICLE

36-1(26)

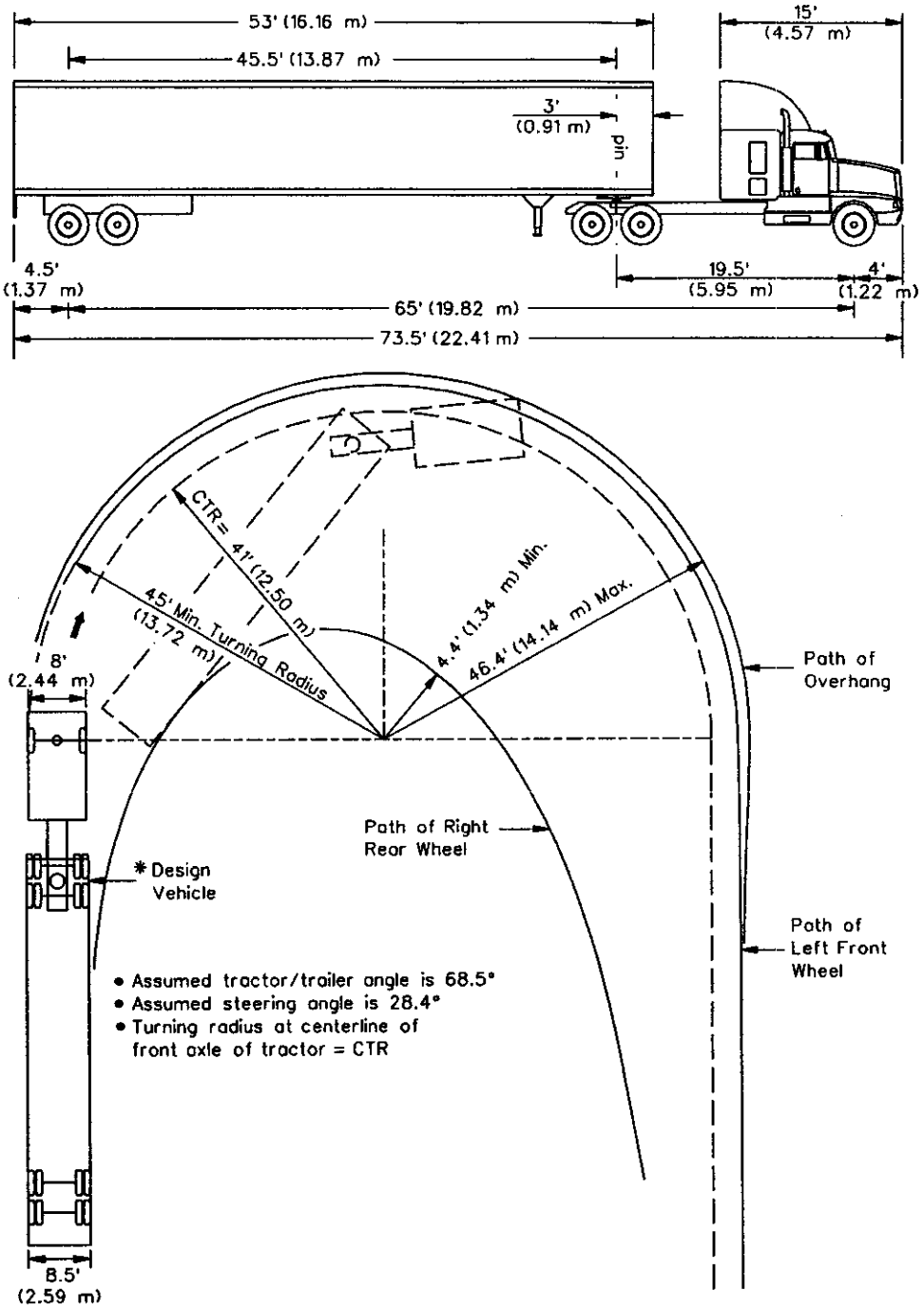
Figure 36-1N



**Note: Presently, trailers are manufactured in lehgths of 40 ft (12.19 m), 42.5 ft (12.95 m), 45 ft (13.72 m), 48 ft (14.63 m), and 53 ft (16.16 m).*

TURNING PATH OF TRACTOR/SEMITRAILER (WB-55 (WB-17)) DESIGN VEHICLE 36-1(27)

Figure 36-1O

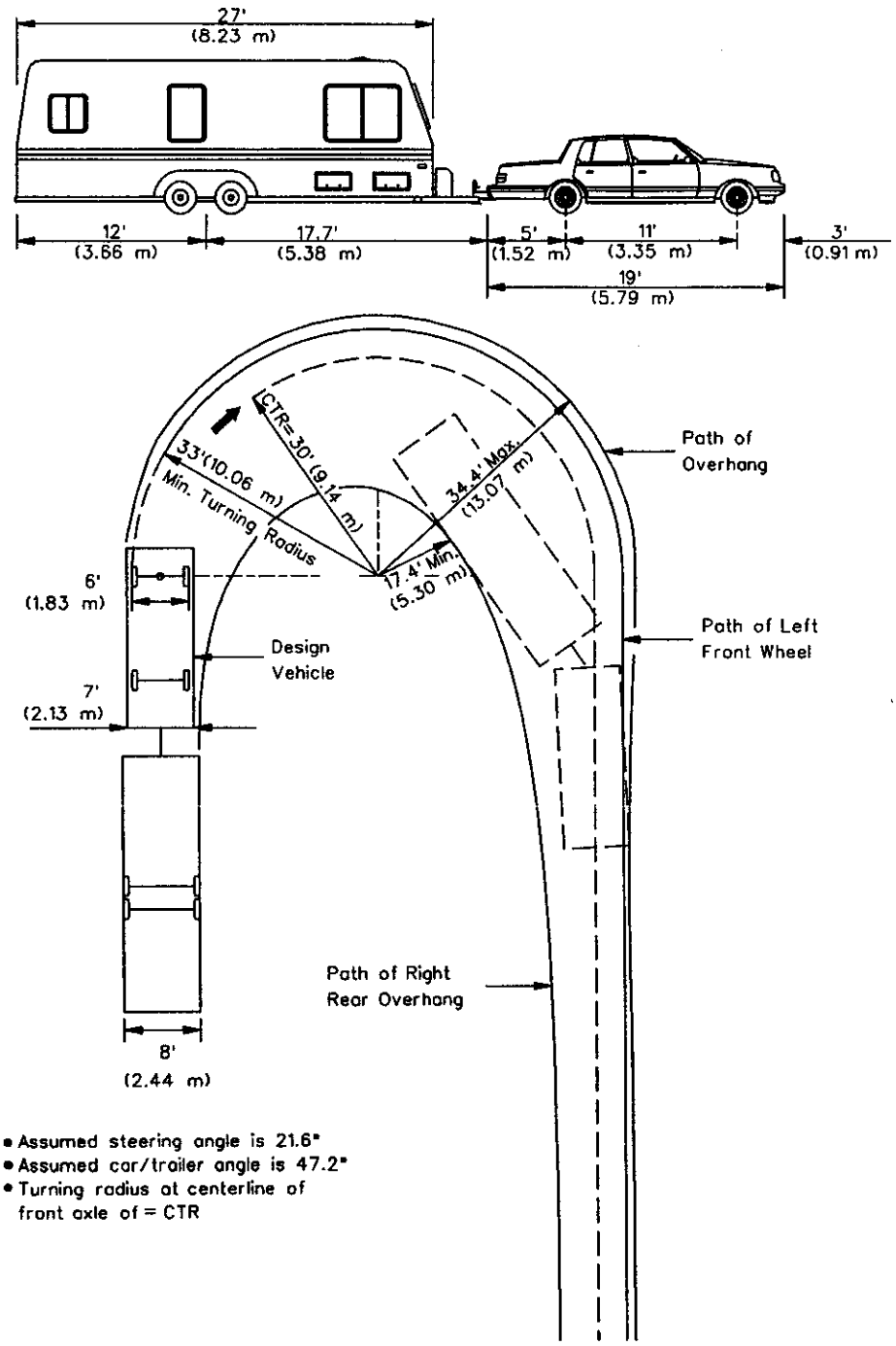


**Note: Presently, trailers are manufactured in lengths of 40 ft (12.19 m), 42.5 ft (12.95 m), 45 ft (13.72 m), 48 ft (14.63 m), and 53 ft (16.16 m).*

TURNING PATH OF TRACTOR/SEMITRAILER (WB-65 (WB-20)) DESIGN VEHICLE

36-1(28)

Figure 36-1P



MINIMUM TURNING PATH OF PASSENGER CAR AND TRAILER (P/T) DESIGN VEHICLE

Figure 36-1Q

For Turn Made		Design Vehicle [1][2][3]
From	Onto	
Freeway Ramp	Other Facilities	WB-65 (WB-20)
Other Facilities	Freeway Ramp	WB-65 (WB-20)
Arterial or SRA[4]	Arterial/SRA	WB-65 (WB-20)
	Collector	WB-55 (WB-17)
	Local	WB-50 (WB-15)
	Local (Residential)	SU*
Collector	Arterial/SRA	WB-55 (WB-17)
	Collector	WB-55 (WB-17)
	Local	WB-50 (WB-15)
	Local (Residential)	SU*
Local	Arterial/SRA	WB-50 (WB-15)
	Collector	WB-50 (WB-15)
	Local	SU*
	Local (Residential)	SU
Local (Residential)	Arterial/SRA	SU*
	Collector	SU*
	Local	SU
	Local (Residential)	SU

**With encroachment, a WB-50 (WB-15) vehicle should physically be able to make the turn.*

Notes:

1. *Use this figure for new construction and reconstruction projects.*
2. *A smaller design vehicle may be considered as a design exception after an investigation of conditions and with justification.*
3. *For 3R projects, the design vehicle will be site specific with justification*
4. *SRA is a Strategic Regional Arterial route..*

SELECTION OF DESIGN VEHICLE AT INTERSECTIONS
(Functional Classification)

Figure 36-1R

Type of Truck Route	Design Vehicle	Maximum Length of Trailer Allowed (m)	Maximum Length Kingpin to Center Rear Axle (m)
Class I	WB-65 (WB-20)	53′ (16.16 m)	45.5′ (13.87 m)
Class II	WB-65 (WB-20)	53′ (16.16 m)	45.5′ (13.87 m)
Class III	WB-55 (WB-17)	53′ (16.16 m)	42.5′ (12.96 m)
Other State Highway	WB-55 (WB-17)	53′ (16.16 m)	42.5′ (12.96 m)
Local Roads and Streets	WB-50 (WB-15)	Not Specified	Not Specified

Illinois Statutes allow additional access off designated truck routes under different conditions. These are defined as follows:

1. *Any tractor/semitrailer vehicle operating on a Class I truck route shall have access onto any street or highway for a distance of 1 mile (1.61 km) from a Class I highway to load and unload and to allow the driver to obtain food, fuel, rest, or repairs. However, some local highway authorities may post truck restrictions altering this provision. Under this condition, the combination truck units allowed access off the Class I truck route may be up to 8 feet (2.59 m) wide with a 53 foot (16.16 m) long trailer.*

2. *Any tractor/semitrailer vehicle operating on a designated State highway (Class I, II, III, or Other State Highways) shall have access on another designated State highway for a distance of 5 miles (8.05 km) on such streets or highways to load and unload and to allow the driver to obtain food, fuel, rest, or repairs.*

3. *If local authorities designate any street or highway for the same large vehicles and the same uses as stated above, such large vehicles may also use these locally designated highways as truck routes. However, these large vehicles are prohibited from using all other streets and highways under local jurisdiction unless an exception is applicable. An exception would be applicable on a local highway where a combination truck unit is within 5 miles (8.05 km) of a designated truck route and where no restricted weight limit is posted on the local highway. In such cases, the combination truck unit may be up to 8 feet (2.59 m) wide, can have an overall length of 65 feet (19.82 m).*

DESIGN VEHICLE SELECTION
(Designated State Truck Route System)

Figure 36-1S

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SEE FORMAL FILE

GROUP II